

**EPA Superfund
Record of Decision:**

**MONTICELLO MILL TAILINGS (USDOE)
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MONTICELLO, UT
09/29/1998**

RECORD OF DECISION
FOR AN INTERIM REMEDIAL ACTION AT
THE MONTICELLO MILL TAILINGS SITE,
OPERABLE UNIT III - SURFACE WATER AND GROUND WATER,
MONTICELLO, UTAH

This is a primary document for Operable Unit III at Monticello, Utah. It will be available in the Administrative Record, which is maintained at the following locations:

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Record of Decision for an Interim Remedial Action
at The Monticello Mill Tailings Site,
Operable Unit III-Surface Water and Ground Water,
Monticello, Utah

August 1998

Prepared by
U.S. Department of Energy
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Acronyms

ARAR	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CT	central tendency
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FFA	Federal Facilities Agreement
ft	feet
MMTS	Monticello Mill Tailings Site
NCP	National Contingency Plan
O&M	operation and maintenance
OU	operable unit
PerT	permeable reactive treatment
RCRA	Resource Conservation and Recovery Act
RME	reasonable maximum exposure
State	State of Utah
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPDES	Utah Pollutant Discharge Elimination Systems
yd 3	cubic yards

Glossary

Administrative Record: All documents which were considered or relied on in selecting the response action at a Superfund site, culminating in the record of decision for remedial action or, an action memorandum for removal actions.

Alluvial aquifer: An aquifer composed of unconsolidated materials (sand, gravel, cobbles, silt) deposited by stream flow. Usually is the uppermost aquifer of a ground-water system and is affected by processes at the land surface (e.g., precipitation, streamflow).

Aquifer: A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs.

Aquitard: Geological formation that may contain ground water but is not capable of transmitting significant quantities of it under normal hydraulic gradients. May function as a confining bed.

Applicable or Relevant and Appropriate Requirements (ARARs): Any state or federal statute that pertains to protection of human life and the environment in addressing specific conditions or use of a particular cleanup technology at a Superfund site.

Baseline Risk Assessment: Baseline risk assessments provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action. They provide the basis for determining whether or not remedial action is necessary and the justification for performing remedial actions. Baseline Risk Assessments can be performed to evaluate both human health risks and ecological risks.

Burro Canyon Formation: A unit of rock composed of sandstone and conglomerate that is present in the subsurface and surface at various locations in the Four Corners region of the U.S. The Burro Canyon Formation is Cretaceous in age. Locally, the Burro Canyon Formation may be used as a source of drinking water.

Conceptual Model: A preliminary "model" of a Site developed using readily available information. Used to identify all potential or suspected sources of contamination, types and concentrations of contaminants detected at the site, potentially contaminated media, and potential exposure pathways, including receptors.

Feasibility Study: A study undertaken by the lead agency to develop and evaluate options for remedial action. The feasibility study emphasizes data analysis, implementability of alternative, and cost analyses, as well as compliance with mandates to protect human health and the environment and attain regulatory standards of other laws. The feasibility study is generally performed concurrently and in an interactive fashion with the remedial investigation, using data gathered during the remedial investigation.

Focused Remedial Investigation: A streamlined process undertaken by the lead agency to determine the nature and extent of the problem presented by a release. A focused remedial investigation emphasizes use of existing data and very limited and specific additional data collection. The remedial investigation includes gathering of specific information to determine the necessity for remedial action and to support the evaluation of remedial alternatives.

Ground Water: Water in the ground that is wholly saturated.

Hazard Ranking System: Formal system employed by the U.S. Environmental Protection Agency (EPA) to rank the hazards of a site on the basis of preliminary investigation and assessment. Ranking scores determine site eligibility for the National Priorities List.

High water content: Containing a large percentage of water per volume of material.

Interim Remedial Action: A remedial action that initiates remediation of a site but may not constitute the final remedy.

Lithic scatter: Scattering of rock material that has been altered by historic or ancient humans for tools or weapons.

National Priorities List: EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund.

Non-time critical Removal Action: A removal action under CERCLA is a short-term immediate action taken to address releases of hazardous substances that require expedited response (removals generally mitigate or stabilize individual threats rather than all threats at a CERCLA site). Non-time critical removal actions require more than 6-months planning prior to field implementation.

Permeable Reactive Treatment (PeRT) Wall: This is a permeable wall that is placed across an aquifer perpendicular to ground-water flow; it contains reactive media that removes or degrades contaminants as the ground water passes through.

Potable: Suitable for drinking.

Potentiometric surface: An imaginary surface representing the level to which ground water would rise in a well.

Radionuclides: Naturally occurring or artificially produced radioactive element or isotope. Radioactive materials spontaneously emit ionizing radiation.

Recharge zone: An area (land surface) in which water infiltrates and reaches the zone of saturation in one or more aquifers.

Receptors: Living organisms that could be exposed to chemicals and/or conditions that can cause adverse effects on those organisms.

Regulatory standards: Concentrations of chemicals that are minimum requirements for quality of a given medium (e.g., ground water, air) for a particular purpose (e.g., drinking water, irrigation). If standards are met, the medium is considered safe to use (i.e., no adverse effects will occur) for that purpose.

Removal Action: A removal action under CERCLA is a short-term immediate action taken to address releases of hazardous substances that require expedited response (removals generally mitigate or stabilize individual threats rather than all threats at a CERCLA site).

Responsiveness Summary: A summary of oral and/or written public comments received by the lead agency on key cleanup-related documents and the agency's response to those comments.

Saturated thickness: The thickness of an aquifer in which all the interconnected spaces are completely filled with water.

Secular equilibrium: The condition whereby sufficient time has elapsed such that the rates of decay and creation are equal for each radioisotope in a radioactive decay series.

Slurry: A highly fluid mixture of water and a very fine-grained solid material.

Stakeholder: Any organization, governmental entity or individual that has a stake in or may be impacted by a given approach to environmental regulation, pollution prevention, energy conservation, etc.

**DECLARATION FOR THE
INTERIM REMEDIAL ACTION
RECORD OF DECISION**

Site Name and Location

Operable Unit III - Surface Water and Ground Water
Monticello Mill Tailings Site
Monticello, Utah

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for Operable Unit (OU) III surface water and ground water at the Monticello Mill Tailings Site (MMTS) in San Juan County, Utah. The selected interim remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site. The State of Utah concurs with the selected interim action.

The selected alternative for the interim remedial action for OU III surface water and ground water at the MMTS is Alternative 2-implementing institutional controls, continuing Millsite dewatering and treatment of excavation water and surface runoff, continuation of ongoing monitoring efforts, and evaluation of a permeable reactive treatment (PeRT) wall through the use of a pilot-scale treatability study. The PeRT wall is an enhancement to the interim remedial action. This remedial action is only an interim measure. If monitoring results indicate that the interim remedial action is not achieving the objectives of-preventing exposure to and reducing contaminants in contaminated ground water, other alternatives will be evaluated from the OU III feasibility study. The final remedy for the site surface water and ground water will be documented in the final Record of Decision (ROD) for OU III.

Assessment of the Site

Current risks to human health associated with the contaminants in OU III surface water and ground water are below levels considered by the U.S. Environmental Protection Agency to be significant. However, this interim remedial action is warranted based on possible future risks to human health and the environment, to limit exposure to contaminants while further information is gathered to characterize the site, to determine the effectiveness of a PeRT wall in removing contaminants, and to evaluate final remedial actions.

Description of the Selected Remedy

OU III is one of three OUs at the MMTS; a remedial investigation and feasibility study have been completed for OU III. A ROD was signed for OUs I (the Millsite) and II (Peripheral Properties adjacent to the Millsite) which stipulated that contaminated materials from OUs I and II would be excavated and placed in an on-site repository. Mill tailings piles and contaminated soils and sediments associated with OUs I and II of the MMTS are the primary sources of OU III surface water and ground-water contamination. These contaminant sources are being excavated and disposed of in the repository just south of the Millsite. Excavation in some areas requires dewatering operations, involving extraction and treatment of ground water; some on-site surface water is also collected and treated during excavation. Thus, source control activities are achieving some mass reduction of contaminants in the aquifer system and, in turn, the surface water. As documented in an Action Memorandum (DOE 1998a), DOE recently initiated a removal action (OU III soils and sediments) to excavate contaminated soils and sediments within the Montezuma Creek floodplain downgradient of the Millsite. Results of the risk assessment indicate that current ground-water contaminant levels may cause unacceptable future risks.

Because Millsite conditions are changing due to excavation activities, it is not yet possible to select a final remedy for OU III surface water and ground water. However, this interim remedial action is prudent to prevent exposure to contaminated ground water and to further reduce contaminant mass in surface water and ground water. This interim remedial action will be ongoing until the final remedy for OU III surface water and ground water is implemented. The major components of this interim remedial action for OU III surface water and ground water include

- Using institutional controls to restrict use of contaminated ground water.
- Continuing ground-water extraction and treatment during excavation and dewatering of the landfill site and continuing, if necessary, after Millsite excavation in areas of concentrated contamination.

- Continuing monitoring efforts, including surface-water and ground-water sampling, to better understand effects of Millsite remediation on water quality.
- Installing a pilot-scale treatability study (PeRT wall) downgradient (east) of the Millsite to assess its effectiveness in reducing contaminant levels in OU III surface water and groundwater.

Declaration

This interim remedial action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements directly associated with this action, and is cost-effective. Although this interim remedial action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim remedial action utilizes some treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for OU III surface water and ground water, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at this portion of OU III. Soils and sediments associated with OU III are being remediated as a separate removal action that is being conducted in accordance with an Action Memorandum addressing that removal action (DOE 1998a). Because this is an interim remedial action ROD, review of this site and of this remedy will be continuing as the final remedial alternatives for OU III are developed.

**DECISION SUMMARY FOR THE
INTERIM REMEDIAL ACTION
RECORD OF DECISION**

1.0 Site Name, Location, and Description

The Monticello Mill Tailings Site (MMTS) is located in southeast Utah, in and near the city of Monticello in San Juan County (Figure 1-1); the city of Monticello has a population of approximately 1,900. Operable Unit (OU) III encompasses ground water and surface water at and downgradient of the Monticello Millsite, as well as contaminated soil and sediment deposited downstream of the Millsite in and adjacent to Montezuma Creek. The Millsite is a 110-acre tract of land owned by the U.S. Department of Energy (DOE). Mill tailings and associated contaminated material remain on the Millsite as a result of historical vanadium and uranium milling operations. An estimated 200,000 cubic yards (yd³) of contaminated material has been identified in the former mill area, and approximately 2.1 million yd³ of tailings and contaminated soil have been identified in the tailings-impoundment area of the Millsite. The tailings were contained in four piles within the floodplain of Montezuma Creek and are in hydraulic contact with a shallow alluvial aquifer underlying the site. The tailings are the primary source of contamination in ground water, surface water, soil, and sediment within OU III. Surface-water and ground-water contamination are the subject of this interim remedial action Record of Decision (ROD).

A detailed description of OU III is presented in the remedial investigation report for OU III (DOE 1998b). MMTS is located in the east-central part of the Colorado Plateau physiographic province. The Abajo Mountains, Great Sage Plain, and Blanding Basin are the three physiographic subdivisions that dominate the landscape in the Monticello area. Approximately 5 miles west of Monticello, the Abajo Mountains, reaching elevations above 11,000 feet (ft), rise more than 4,000 ft above the broad, nearly flat, upland surface of the Great Sage Plain. A canyon network consisting of the upper part of Montezuma Creek and its tributaries has incised the western part of the Great Sage Plain. Montezuma Creek canyon becomes more deeply incised as the creek flows southward into the Blanding Basin.

The Millsite and adjoining areas within the Montezuma Creek valley are underlain by two ground water-bearing units (aquifers). The upper unit is the alluvial aquifer consisting of unconsolidated soil, sediment, and rock. The water table is generally 2 to 10 ft below the ground surface. The alluvial aquifer both discharges ground water to and receives surface water from Montezuma Creek depending on location. The alluvial aquifer and Montezuma Creek have been contaminated by past Millsite activities. The contaminants that present the greatest risks at the site include uranium, vanadium, lead-210, and arsenic. A lower sandstone aquifer within the Burro Canyon Formation, is locally separated from the alluvial aquifer by sandstones and shales of the Mancos Shale and the Dakota Sandstone Formations that restrict vertical ground-water movement. The Burro Canyon Formation is used as a secondary source of potable water.

The upper surface of the Burro Canyon Formation is about 125 ft below the ground surface in the west end of the Millsite and 60 ft below ground surface immediately east of the Millsite. About 4,000 ft east of the Millsite, erosion has removed the entire thickness of the relatively impermeable beds of the Mancos Shale and Dakota Sandstone Formations and the alluvial aquifer and Burro Canyon aquifer are in direct contact. Where the aquifers are in direct contact, ground water flows upward from the Burro Canyon aquifer into the alluvial aquifer. The upward movement of Burro Canyon ground water seems to have prevented contaminant movement from the alluvial aquifer to the Burro Canyon aquifer.

MMTS is a former uranium and vanadium ore-processing mill that was placed on the National Priorities List (NPL) in 1989, because of potentially elevated risks associated with contaminated materials related to past milling activities. The Millsite and nearby contaminated properties are currently being remediated in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Surrounding private lands are used for residential, recreational, and agricultural (both farming and grazing) purposes. Ground water within the alluvial aquifer is not currently used for any domestic, agricultural, or industrial purpose. Water from Montezuma Creek is used for agricultural purposes.

2.0 Site History and Enforcement Activities

2.1 Site History

The site operated from the mid-1940s until 1960 to produce materials used in the production of steel and construction of nuclear weapons. Initially, the mill was built to produce only vanadium for the purpose of hardening steel needed for World War II. With the scale-up of the nuclear weapons program, the site began processing domestic uranium ore as well. Uranium and vanadium ores that were mined from across the

region were transported to the Millsite for milling and refining. The uranium concentrate was shipped to production facilities that manufactured nuclear weapons components; vanadium concentrate was shipped to steel-producing facilities. Processing of the ores resulted in the generation of mill tailings, which were disposed on the site in four tailings piles. The tailings contain elevated concentrations (compared to background) of a variety of radioactive materials and heavy metals that pose risk to human health and the environment.

The tailings piles were covered with soil and seeded with native grasses in the early 1960s to prevent erosion by wind and water. However, the high water content in the tailings and infiltration of precipitation provided a continuing source of ground-water contamination as it seeped through the subsurface over time. Some of the piles extend into the alluvial aquifer water table and contaminants are leached by ground water. Montezuma Creek becomes contaminated as contaminated ground water discharges to the surface water east of the Millsite. Contamination of the creek also occurs as it flows through contaminated soils and sediments. Prior to Millsite excavation, seeps emanating from the tailings piles also contributed to Montezuma Creek contamination.

2.2 Investigation History

Environmental investigations of the MMTS have been conducted at and near OU III since the early 1950s. Investigations performed before 1979 focused primarily on surface-water quality in Montezuma Creek and to a lesser degree on ground-water quality in the alluvial aquifer. Before the mill closed in 1960, investigations focused on the effects on surface-water quality in Montezuma Creek from milling operations, stream overflow, and seepage from tailings ponds and piles. Those early investigations assessed effects on the surface water and ground water largely on the basis of uranium and radium-226 concentrations in samples collected upstream and downstream of the Millsite. As early as 1950, radium levels in Montezuma Creek were known to be increasing as a result of releases from uranium milling. Between 1960 and 1979, surface-water samples were occasionally collected from Montezuma Creek to assess site impacts to surface-water quality. Ground-water sampling was also performed during this period. An environmental assessment report (Bendix 1980) noted an increase in uranium and radium concentrations in Montezuma Creek as a result of the facility. This 1980 report also noted an indication of ground-water contamination downgradient (east) of the Millsite.

Environmental investigations performed between 1979 and October 1992 were more comprehensive than earlier studies. Routine monitoring of surface water and ground water from 1979 to 1991 is documented in annual environmental monitoring reports [Bendix (1980), Korte and Thul (1981 to 1984); Korte and Wagner (1985, 1986); Sewell and Spencer (1987); and DOE (1988a, 1989, 1990a, 1991, 1992)]. More recent efforts have focused on supplementing monitoring data with information needed to complete ground-water modeling as part of the remedial investigation for OU III. Ongoing activities associated with the site include continued monitoring and collection of surface-water and ground-water data to be used in evaluating final cleanup alternatives.

2.3 Enforcement Activities and Administrative History

The administrative history of OU III is intricately linked with the histories of OU I and OU II, the other components of the MMTS. OU I addresses excavation of mill tailings and other contaminated materials from the Millsite and containment of these materials in a permanent repository; OU II addresses the remediation of peripheral properties that are contaminated by radioactive material from the Millsite. In December 1988, DOE, the U.S. Environmental Protection Agency (EPA), and the State of Utah (State) entered into a Federal Facilities Agreement (FFA) (DOE 1988b) pursuant to Section 120 of CERCLA, for the MMTS. A Hazard Ranking System score was developed that led to the inclusion of MMTS on EPA's National Priorities List on November 16, 1989.

The Monticello Vicinity Property site was listed on the National Priorities List in 1986 and consists of 420 contaminated vicinity properties grouped into 8 operable units. Contamination of these properties occurred when mill tailings from the Millsite were wind blown off the Millsite or used as fill or other similar purposes. A ROD was signed for the Monticello Vicinity Property site in 1989. Approximately 414 of the properties have been remediated to date. Contaminated material from the vicinity properties was placed at the Millsite for later disposal in the repository.

As stated in the FFA, DOE serves as the Federal lead agency and provides the principal staff and resources to plan, direct, and implement response actions at the MMTS. EPA and the State share the responsibility for oversight of the MMTS activities performed under the FFA. However, EPA has ultimate responsibility and authority for program oversight. Oversight by the State is performed by the Utah Department of Environmental Quality.

In 1990, the FFA parties signed a ROD (DOE 1990b) for the MMTS, which stipulated that contaminated materials from OUs I and II would be excavated and placed in an on-site repository; approximately 1,800,000 yd³ of tailings and contaminated soil were identified at that time. The ROD for MMTS also stipulated that a ROD for OU III would be produced when sufficient data were gathered through a focused remedial investigation/feasibility study and specified that "the Upper and Lower Montezuma Creek peripheral properties" (which are now referred to as Upper, Middle, and Lower Montezuma Creek) would be remediated as part of OU III. Remediation of OUs I and II is currently being implemented pursuant to the 1990 ROD. OU I is scheduled for completion, as defined by concurrence on the Millsite Restoration Remedial Action Report, by October 2001.

OU III soil and sediment cleanup are being conducted as a non-time critical removal action that will be completed in the summer of 1999 (DOE 1998a). The selected action involves excavation of contamination in discrete areas to alternate cleanup levels through the application of supplemental standards to comply with 40 Code of Federal Regulations (CFR) Part 192 requirements, and implementation of institutional controls (restrictive easements) to ensure that habitable structures are not built within the OU III contaminated soil and sediment areas. These actions reduce risk from exposure to contaminants and remove the continued soil and sediment source to surface-water and ground-water contamination.

2.4 Highlights of Community Participation

The public participation requirements of CERCLA Section 113(k)(2)(B)(i-v) and Section 117 are being followed for this interim remedial action. MMTS has a Community Relations Plan that is updated annually; the 1999 Plan is currently undergoing revision. The community relations activities include (1) distribution of fact sheets and other written materials, (2) news releases to the local newspaper, (3) public meetings, (4) display ads announcing the availability of key documents and meetings, (5) public comment periods, and (6) responsiveness summaries for Records of Decision.

Copies of all site-specific documents used in developing the interim-action decision were made available to the public through the Administrative Record for the site. The Administrative Record is housed at the Monticello City Offices and at the DOE-Grand Junction Office. Draft versions of the OU III Remedial Investigation and Alternatives Analysis documents were released in January 1998 (DOE 1998c and DOE 1998d) and the Feasibility Study and Proposed Plan in March 1998 (DOE 1998e and DOE 1998f). These documents were placed in the reading room and Administrative Record in March 1998, prior to the start of the public comment period. Copies of the Proposed Plan (DOE 1998f) for an interim remedial action at OU III were also placed in the site Administrative Record and distributed to stakeholders in March 1998. The notice of availability for all these documents was published in the local Monticello newspaper on March 18, 1998. A public comment period on the interim remedial action was held from March 27 to April 27, 1998, and a public meeting was held on April 7, 1998. At this meeting, representatives from DOE, EPA, and the State answered questions about the site and the preferred alternative, which has become the selected interim remedial action. A summary of the meeting and public comments received at that meeting and during the public comment period are presented in the Responsiveness Summary of this document (Appendix A) for inclusion in the Administrative Record. The decision for an interim remedial action at this site is based on information in the Administrative Record.

2.5 Scope and Role of Operable Unit III Surface Water and Ground Water Within Site Strategy

OU III is one of three OUs at the MMTS. A draft remedial investigation and feasibility study have been completed for OU III. A ROD was signed for OUs I and II which stipulated that contaminated materials from OUs I and II would be excavated and placed in an on-site repository. OU III surface-water and ground-water quality is expected to be positively affected by remediation of OUs I and II and by excavation of OU III soils and sediments as specified in the Action Memorandum (DOE 1998a). Because it is not possible to definitively predict the effects remediation will have on OU III, the interim remedial action is designed to (1) prevent the use of contaminated ground water by implementing institutional controls, (2) remove soluble contaminants from the ground water and, in turn, surface water, by treating extracted groundwater through dewatering activities, (3) continue to monitor the changing conditions in the alluvial aquifer and in surface water, and (4) examine the feasibility of a PerT wall for in-situ treatment by conducting a pilot-scale treatability study. Treated water (generated by treating water pumped during Millsite excavation or, if necessary, following Millsite excavation) will meet Utah Pollutant Discharge Elimination Systems (UPDES) requirements. The interim remedial action will complement OU I and OU III soil and sediment cleanup activities and will have no negative effect on these cleanup efforts. The interim remedial action is consistent with the long-term strategy for surface-water and ground-water cleanup and will not adversely affect the final remedy for OU III.

3.0 Summary of Site Characteristics

3.1 Hydrologic Setting

3.1.1 Surface Water

The following discussion is summarized from the OU III Remedial Investigation report (DOE 1998c).

The primary surface-water body in the OU III area is Montezuma Creek, which flows west to east throughout most of the OU III area. Approximately 2.5 miles east of the Millsite, Montezuma Creek is joined by a lesser tributary, Vega Creek, at which point stream flow is south through Montezuma Canyon (Figure 1-1). Other surface-water bodies include seeps and springs, municipal water-treatment lagoons, Loyd's lake, and various ponds used to water livestock.

Typical flow rates in Montezuma Creek in the OU III area are about 1 cubic foot per second. Flow is generally perennial; however, portions of the creek are seasonally dry some years. Peak flow of 30 cubic feet per second may occur during spring runoff. Sources to Montezuma Creek are the in-stream base flow entering the Millsite near Highway 191, run-off from the surrounding watershed, and any inflow or gain of shallow ground water.

The State of Utah groups surface waters of the State into classes so as to protect against controllable pollution for the, beneficial uses designated within each of those classes (R317-2-6, U.A.C.). Four broad classes of use are recognized-domestic (1), recreational (2), aquatic (3), and agricultural (4). Additionally, subclasses are identified within some of these classes (e.g., 2A, 2B, etc.). Higher standards of water quality apply to lower numbered classes and to those subclasses having letters earlier in the alphabet.

Montezuma Creek water is not used as a source of potable water; however, it is used as a water source for livestock. Montezuma Creek is classified in the Utah Administrative Code as follows:

- 1C-Protected for domestic purposes with prior treatment processes as required by the Utah Division of Drinking Water.
- 2B-Protected for secondary contact recreation such as boating, wading, or similar uses.
- 3A-Protected for cold water species of game, fish, and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
- 4-Protected for agricultural uses including irrigation of crops and stock water.

3.1.2 Ground Water

The hydrologic units associated with OU III are an upper alluvial aquifer consisting mostly of Quaternary alluvium and colluvium, an aquitard of Mancos Shale and Dakota Sandstone, and the underlying Burro Canyon Formation aquifer. Below the Burro Canyon aquifer is the Brushy Basin Member of the Morrison Formation, which is relatively impermeable to ground-water flow. Ground-water flow in the alluvial aquifer is generally to the east, parallel to the axis of Montezuma Creek. Flow rates of water moving past the eastern edge of the Millsite are approximately 40 to 50 gallons per minute.

The saturated thickness of the alluvial aquifer ranges from approximately 2 to 25 ft but is generally less than 15 ft. The alluvial aquifer is recharged by infiltration of precipitation, surface-water loss from Montezuma Creek, and lateral ground-water flow from upgradient of the Millsite. Leaking water lines, from the city of Monticello water supply system, are suspected to recharge the aquifer in the northwest portion of the Millsite. Depths to ground water generally range from 8 to 15 ft. However, in the northwest area of the Millsite, and in areas of eastern Upper Montezuma Creek, ground water is present within several feet of ground surface.

As with surface water, the State of Utah also classifies ground-water resources (R317-6, U.A.C.). The following ground-water designations have been established:

- Class IA-Pristine Ground Water
- Class IB-Irreplaceable Ground Water
- Class IC-Ecologically Important Ground Water
- Class II-Drinking Water Quality Ground Water
- Class III-Limited Use Ground Water
- Class IV-Saline Ground Water

Class IA ground water has the most stringent water quality standards; Class IV has the least stringent. The alluvial aquifer is not currently used for drinking water, irrigation, or livestock watering; because it could be a potential source of drinking water in the future, Utah ground-water standards classify the alluvial ground water as Class II.

The Mancos Shale and Dakota Sandstone act as aquitards between the alluvial aquifer and the underlying Burro Canyon aquifer in the Millsite area. Ground-water flow within these aquitards is minimal and predominately vertically downward.

The Dakota Sandstone has been eroded away and the alluvial aquifer is in direct contact with the Burro Canyon Formation in the Montezuma Creek Valley approximately 4,000 ft east of the Millsite. Ground water discharges from the Burro Canyon aquifer to the alluvial aquifer and Montezuma Creek within the valley where Dakota Sandstone is absent. Discharge also occurs from cliff outcrops along the margin of Montezuma Canyon below the Vega Creek confluence. The primary recharge zone for the Burro Canyon aquifer is in outcrop areas on the east side of the Abajo Mountains.

The thickness of the Burro Canyon Formation is 114 ft approximately 600 ft east of the Millsite. The depth from ground surface to the potentiometric surface at this location is about 33 ft. The potentiometric surface of the Burro Canyon aquifer is above ground surface in the easternmost portion of Upper Montezuma Creek, where the farthest downgradient monitoring wells are located.

The city of Monticello occasionally withdraws Burro Canyon ground water from city-owned wells for non-potable use only. Burro Canyon ground water has also been used by private households. Most of the wells are old and have not been used for several years; however, some wells have been used during the last 10 years for domestic irrigation and for watering livestock.

3.2 Operable Unit III Source Areas

Based on previous investigations, including the Remedial Investigation for OUs I and II (DOE 1990c), the primary source of ground-water contamination associated with OU III are the mill tailings piles on the Millsite (OU I). To a lesser extent, contaminated soils and sediments in the floodplain of Montezuma Creek could serve as a secondary source of ground-water contamination, but the results from surface-water sampling indicate this is not a significant source.

3.3 Nature and Extent of Contamination

Monitoring data indicate that ground-water contamination is restricted to the alluvial aquifer; the contaminant plume follows Montezuma Creek and extends approximately one mile east of the Millsite. Sediment contamination extends further down Montezuma Creek, past the confluence with Vega Creek. Monitoring data also indicate that surface water in Montezuma Creek is contaminated throughout the OU III area. Removal of the major source of ground-water contamination (the tailings piles), including associated dewatering and treatment, through remediation of OU I is expected to have a major positive effect on the quality of OU III ground water and surface water. The full effect of the OU I remediation on ground-water and surface-water quality will not be known for some time. Implementing the proposed interim remedial action ensures protectiveness of human health and the environment until sufficient information is available to make a final remedial action decision. Contaminated media are discussed further below.

3.3.1 Surface-Water Contamination

Surface-water samples collected from seeps and springs on the Millsite and from Montezuma Creek on and downstream of the Millsite contain elevated concentrations (relative to background) of various metals, uranium decay-series radionuclides, sulfate and nitrate. The highest concentrations were detected in samples collected from tailings pile seeps on the Millsite. One or more samples collected from the seeps contained arsenic, copper, radium-226, selenium, and gross alpha that exceeded Utah surface-water quality standards. Among samples collected from Montezuma Creek on the Millsite, only selenium and gross alpha were detected in concentrations above a Utah surface-water standard.

Downstream of the Millsite, concentrations of arsenic, copper, manganese, molybdenum, selenium, uranium, vanadium, and gross alpha exceed background concentrations. Contaminant concentrations generally decrease with distance from the Millsite and generally reach background concentrations in the easternmost section of OU III. Copper and selenium concentrations sporadically exceeded Utah standards in samples collected at different monitoring locations throughout the remedial investigation. Only uranium, gross alpha activity, and manganese were detected above background levels throughout OU III. Elevated manganese concentrations in the surface water at distances greater than 4,000 ft from the Millsite are attributed to discharge of Burro Canyon ground water which is naturally high in manganese. The Utah standard for

gross alpha activity was exceeded consistently throughout the remedial investigation at all downstream sampling locations. The high gross alpha activity is attributed to uranium in surface water. With the exception of gross alpha, all contaminants in OU III downgradient from the Millsite are reduced to levels suitable for any purpose relative to Utah surface-water quality standards. Table 3.3.1-1 compares surface-water sample results with the applicable standards for all contaminants that were detected above a standard in one or more sample collected since November 1992. The Millsite sample concentrations include samples collected from the tailings pile seeps. The UCL 95 values represent the 95 percent upper confidence limit of the mean concentration computed from all samples collected from each Millsite and downstream surface-water monitoring location, respectively, between November 1992 and April 1996.

Surface-water data obtained since November 1992 (DOE 1998c, e) indicate that concentrations of several contaminants decreased at some locations in Montezuma Creek after flow from a tailings pile seep was intercepted between October 1994 and April 1995. The monitoring data for the periods prior to and after ditch construction do not indicate significant changes in concentrations during the respective periods suggesting quasi steady-state conditions have been achieved with respect to other sources. However, some contaminants indicate a trend of slightly decreasing concentrations. High-flow during the spring has a variable effect on concentrations; both a decrease and an increase in concentrations are seen.

3.3.2 Ground-Water Contamination

Ground-water samples from wells completed in the alluvial aquifer contained elevated concentrations (relative to background) of various metals, uranium decay-series radionuclides, sulfate, and nitrate. The highest concentrations were detected in samples collected from wells on the Millsite. Arsenic, manganese, molybdenum, selenium, vanadium, uranium, and lead-210 have migrated through the alluvial aquifer off the Millsite and have contaminated the alluvial ground water on private property east of the Millsite (Figure 3.3.2-1). Selenium, nitrate, and radium-226/228 were detected in concentrations above Federal/State regulatory standards on the Millsite only. Molybdenum, selenium, and uranium were detected in concentrations above regulatory standards both on the Millsite and downgradient of the Millsite. The downgradient extent of uranium, which has migrated the farthest in the alluvial aquifer, is approximately 5,000 ft from the eastern Millsite boundary. The volume of uranium-contaminated ground water greater than the Uranium Mill Tailings Radiation Control Act (UMTRCA) ground-water standard of 30 pCi/L (or 44 $\mu\text{g/L}$) is estimated to be 97,000,000 gallons. Contaminants that were detected in excess of various ground-water regulatory standards in one or more samples collected during the remedial investigation are listed in Table 3.3.2-1. The UCL 95 values represent the 95 percent upper confidence limit of the mean concentration computed from all samples collected from each Millsite and downstream monitoring well, respectively, between November 1992 and April 1996.

Contaminant concentrations in ground water generally decrease with distance from the Millsite. Just east of the Millsite, concentration contours change direction from being predominantly east-west (parallel to ground-water flow on the Millsite) to being northwest to southeast. The concentration contours immediately east of the Millsite are consistent with the change in ground-water flow direction, which generally follows the alignment of the historic natural channel of Montezuma Creek in that area.

The ground-water data collected since November 1992 during the remedial investigation (DOE 1998c) do not indicate significant changes in concentration over time, which suggests that the plumes had generally reached near steady-state conditions with respect to contaminant sources on the Millsite prior to OU I remediation. At some monitoring locations the concentrations of some contaminants are consistently lower during seasonal high-flow periods (high water levels and greater dilution) relative to low-flow periods. At other locations, some contaminants exhibit the opposite relationship between flow conditions and concentrations.

Burro Canyon ground water is not contaminated. The Mancos Shale and Dakota Sandstone appear to be adequate aquitards in areas where the water level in the alluvial aquifer is greater than that in the Burro Canyon aquifer (downward flow potential). East of the Millsite, where the alluvial aquifer directly overlies the Burro Canyon aquifer, there is upward flow from the Burro Canyon aquifer to the alluvial aquifer which prevents contaminant movement into the Burro Canyon aquifer. In these eastern areas, the alluvial aquifer ground-water quality is strongly affected by influx from the Burro Canyon aquifer.

3.4 Conceptual Model of Contaminant Transport

Table 3.4-1 summarizes the potential human-health exposure pathways for all of OU III. Although the pathway of most concern for ground water is ingestion as a drinking water source, interaction of ground water with other media (e.g., by irrigation, discharge to surface water) can have an effect on risk posed by other pathways. A secondary pathway of exposure, ingestion of beef or game that ingest contaminated vegetation, water, and soil was also evaluated.

Figure 3.4-1 depicts the ecological conceptual site model. This model considered effects of contaminant uptakes in vegetation in contact with contaminated surface water or ground water and subsequent ingestion of this vegetation as a major food source. The effects of ingesting contaminated prey (e.g., swallows, flying insects) were also evaluated as well as the effects from the use of contaminated surface water as a primary source of water for ingestion. The likelihood of exposure from any of the potential pathways is discussed in Section 4.0.

4.0 Summary of Site Risks

This section presents a semiquantitative description of the potential risks associated with surface water and ground water at OU III.

4.1 Human-Health Risks

The Baseline Human Health Risk Assessment for OU III (DOE 1998g) indicated that the most significant exposures could occur from the potential future ingestion of contaminated ground water. This ground water is currently not used for domestic purposes and its lack of palatability makes its future use unlikely, though this possibility was evaluated. If the alluvial ground water was used as a source of drinking water, significant long-term risks would occur from both carcinogens (contaminants that cause cancer) and noncarcinogens (contaminants that cause other negative health effects except cancer). Risks were calculated for both a reasonable maximum exposure (RME; above average, but within the range of possible values) and a central tendency (CT) exposure (average or best-estimated).

For carcinogens, using the RME scenario, approximately 4 in 10,000 people could develop cancer from drinking the alluvial ground water over a lifetime (assumed to be 70 years). This is four times greater than the upper end of a risk range used by EPA to evaluate risks from carcinogens. Using the CT scenario, risks of developing cancer are 9 in 100,000 people; this is within EPA's acceptable risk: range. For noncarcinogenic contaminants, the RME risk would be 10 times greater than the value defined as acceptable by EPA; CT risks for noncarcinogens would be 5 times EPA's acceptable value. Risks calculated for the CT scenario from carcinogens related to OU III are 10 to 14 times those associated with background contaminant concentrations. Risks associated with noncarcinogens are 42 times background. The contaminants that pose the greatest amount of risk include uranium, vanadium, lead-210, and arsenic. More details on the actual numerical values associated with site contaminants and their interpretation was presented in the Baseline Human Health Risk Assessment.

The most likely future use of-the Millsite is for recreational purposes. The community has a strong interest in expanding its existing nine-hole golf course to an eighteen hole golf course that would encompass the Millsite. It is assumed that future residential development will occur east of the Millsite, and these future residents are the most likely receptors. Risks from ingestion of surface water were evaluated along with other pathways under a recreational/agricultural use scenario. This scenario assumes Montezuma Creek could be used for hunting, hiking, and other similar activities and that water would only be infrequently ingested in small amounts. Exposure associated with ingestion of surface water did not produce significant risk. Risks from eating game or beef that ingest contaminated soil, vegetation, and water were estimated by DOE to be negligible; contaminant levels in animals were measured by EPA and found to be safe.

4.2 Environmental Risk

Vegetation and Wildlife. DOE conducted an ecological risk assessment (DOE 1998h) to evaluate potential risks to the environment associated with exposure to contaminants of concern within OU III. This assessment determined that surface-water ingestion is not a risk-driving pathway for environmental receptors and contaminated ground water is of negligible concern because a direct exposure pathway does not exist between the receptors and ground water. The only receptors that potentially could be exposed to ground water directly are plants with roots deep enough to tap into the alluvial aquifer. Animals or aquatic organisms can be indirectly exposed to ground water by ingesting the plants that take up contaminated ground water or by ingesting or directly contacting certain surface waters that receive ground-water discharge. Results of the risk assessment indicate that these potential exposures to contaminated ground water do not pose an excess risk to environmental receptors.

Table 3.4-1 Human Exposure Pathway Analysis Summary

Exposure Medium	Potential Routes of Exposure	Potential Receptors	Comments
Air	Inhalation	Agricultural workers, recreational users, future residents	Particulate inhalation
Soil and sediment	Ingestion, inhalation, direct radiation exposure (gamma)	Agricultural workers, recreational users, future residents	Incidental ingestion, inhalation of dust
Surface water	Ingestion (incidental)	Agricultural workers, recreational users, future residents	Dermal exposure is insignificant when compared to ingestion.
Ground water	Ingestion (as a drinking water source)	Future residents	Currently not a complete pathway; this is an improbable, but potentially complete future exposure pathway.
Beef/game tissues	Ingestion	Agricultural workers, recreational users, future residents	Beef/game are exposed to contaminated vegetation, surface water, and soil.

Air quality. Air quality is not an issue with this site, except for any dust generated during remediation actions. Dust suppression measures will be taken during remediation to prevent dust generation.

Surface Water, Ground Water, and Wetlands. Surface-water and ground-water contamination are the focus of this interim remedial action. Both surface-water and ground-water quality are expected to improve through implementation of the interim remedial action though the action affects ground water directly. Sediments in the Montezuma Creek floodplain and wetland areas are also contaminated; these are being addressed through a separate removal action.

Scenic, Historic, and Cultural Resources. Scenic resources within the area include rural and pastoral views of the plains and mountains and picturesque views of canyon walls within the Montezuma Creek valley. Some of these views may be temporarily disturbed during construction, but effects will not be permanent. Historic and cultural resource surveys conducted within the OU III area revealed one historic site on the floodplain of Montezuma Creek and numerous prehistoric sites along the canyon walls of Upper, Middle, and Lower Montezuma Creek. The historic site is a homestead; the prehistoric sites are rock-shelters and open lithic scatters. The interim remedial action will not have an adverse effect on these sites.

4.3 Need for the Interim Remedial Action

The primary objectives of the interim remedial action are to prevent exposure to contaminated ground water and to reduce contaminant levels in ground water and surface water. The interim remedial action is needed primarily to achieve risk reduction in the near term by removing contamination (through dewatering and treatment) that is being disturbed through remediation of OUs I and II. This action will prevent further environmental degradation while a long-term solution for OU III can be evaluated. Institutional controls will prevent exposure to contaminated ground water while the near-term interim measures are being implemented. Monitoring data will provide information needed to develop a long-term solution as well as provide an assurance that any unexpected contaminant releases can be detected. PeRT wall treatability studies will assist in determining the viability of that technology as a longer term remedial alternative and may also serve as an enhancement to the overall interim remedial action.

5.0 Description and Comparison of Interim Remedial Action Alternatives

This section provides a brief discussion of the alternatives being considered for interim remedial action of OU III surface water and ground water. The Feasibility Study for OU III (DOE 1998f) contains an evaluation for a range of remedial alternatives that are being considered for the final remedial action at the site. The alternatives include a range of options for institutional controls (restrictive easements, deed annotation, administrative controls through the State) and ground-water extraction and treatment technologies (such as conventional water treatment and the PeRT wall). However, only two actions were considered to address the interim remedial action goals of exposure prevention and contaminant reduction.

5.1 The No-Action Alternative (Alternative 1)

Consideration of the no-action alternative is required by CERCLA. The no-action alternative for OU III surface water and ground water includes long-term monitoring. Monitoring is currently being conducted on a semiannual basis; this monitoring frequency would continue. Up to 24 wells are in the monitoring program, including 3 upgradient wells. Eight surface-water locations are sampled downstream of the Millsite, including 1 upstream location. All samples are analyzed for metal and radiologic COCs. Refer to the OU III Annual Monitoring Program (DOE 1997) for more details. The present plan for monitoring will be evaluated to determine if additional sampling locations are necessary and if the present frequency of sampling events is adequate to assess changing Millsite conditions and to support selection of the final remedy.

5.2 Institutional Controls, Millsite Dewatering and Treatment, Monitoring, and PeRT Wall Installation and Evaluation (Alternative 2)

Institutional controls prohibiting the use of water rights within the area of contaminated ground water will be implemented through the State Engineer. A moratorium on drilling of water wells into the contaminated aquifer will be put in place. Surface-water and ground-water monitoring (as described above) will be used initially to assess the effects of Millsite cleanup activities on the concentration of contaminants in the ground water and Montezuma Creek and be used in subsequent ground-water modeling, if necessary. Additional wells will be installed and monitored to support evaluation of the PeRT wall treatability study.

In conjunction with the cleanup of OU I, ground-water dewatering and treatment will continue and also contribute to the remediation of OU III. Currently, water is being treated with a combination of chemical and physical processes. Chemicals are added to precipitate contaminants as particulates, which are filtered out using microfiltration and reverse osmosis. Secondary wastes are disposed in the onsite repository. Treated water is discharged to Montezuma Creek in accordance with UPDES requirements. Current treatment rates range from 50 to 200 gallons per minute. Following remediation of OU I, water treatment may continue, if necessary. Ground-water and surface-water monitoring will be conducted to determine the effectiveness of the PeRT wall and ground-water treatment in restoring the aquifer to natural conditions. A five-year review of the data will be conducted to determine the effectiveness of the interim remedial action.

In-situ treatment of ground water will be evaluated with a PeRT wall installed across the contaminant plume. The selected location for the PeRT wall is in the area east of Pond 3 (the collection pond for the water treatment plant located just east of the Millsite). The PeRT wall will be oriented perpendicular to the direction of ground-water flow; contaminants are removed as ground water flows through the wall, thereby preventing additional downgradient movement of contamination. The exact location of a PeRT wall is not yet finalized and much of the site-specific information needed has not been determined. Laboratory treatability studies are ongoing and field treatability studies will be completed to determine the optimum configuration of the PeRT wall.

The PeRT wall will be a funnel-and-gate system that consists of an impermeable barrier (such as a slurry wall or sheet piles) to direct ground-water flow through a gate made of reactive material. The size of the wall selected for OU III will be optimized for site-specific geologic and hydrologic conditions, operation and maintenance (O&M) requirements, and economic considerations. Before emplacement of the PeRT wall, additional treatability studies will be conducted with various reactive materials to determine the most suitable material for site-specific conditions.

It is anticipated that the PeRT wall will operate for a minimum of 5 years, unless preliminary monitoring results indicate problems with the system. The wall may become part of the final proposed remedial action if monitoring demonstrates it is performing successfully. When the wall is removed at the end of its operation, the contaminated reactive materials will be disposed in an appropriate disposal facility.

Preliminary treatability study results for the PeRT wall are favorable. Using site-specific waters, materials tested have shown to be effective at removing contaminants of concern, especially uranium. As with many processes, some uncertainty regarding performance exists in scaling up from laboratory to full-scale implementation. Field installation of the PeRT wall is expected to begin in the spring of 1999 and be completed by the end of the year. Monitoring is ongoing. Additional wells will be installed in conjunction with PeRT wall construction to assess its performance. An annual review of the data collected will be conducted to determine the effectiveness of the PeRT wall.

This alternative complies with applicable or relevant and appropriate requirements (ARARs) to the maximum extent practicable, given the limited nature of the interim remedial action. All data collection activities (including new well installation, water sampling, etc.) will take place in accordance with established protocols and procedures, including those regarding disposal of investigation-derived waste (GJO 1997 and MACTEC 1996). Treatment and discharge of water through dewatering activities will meet UPDES requirements. The interim remedial action will not meet federal or state drinking- or surface-water standards, but because the goal of the interim remedial action is simply contaminant reduction in ground water, these specific standards are not applicable to the proposed action.

5.3 Summary of Comparative Analysis of Alternatives

CERCLA requires that cleanup alternatives for a site be evaluated against nine criteria. These criteria and a comparative analysis are provided in Table 5.3-1 and discussed in the following sections.

5.3.1 Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative 2 is anticipated to be protective of human health and the environment by preventing exposure to contaminated ground water through the use of institutional controls, which will (1) lock out existing water rights, if any, and (2) place a moratorium on new water well drilling into the contaminated alluvial aquifer. Treatment of ground water collected during excavation dewatering activities will remove contaminants from the aquifer. Discharge of treated water to Montezuma Creek will comply with UPDES requirements. The pilot-scale treatability study of the PeRT wall will evaluate its effectiveness in reducing contaminant levels downgradient of the Millsite. The PeRT wall is designed to act as a "filter" to retain contaminants at the wall and release clean water downgradient.

Table 5.3-1 Comparison of the Alternatives Against the Nine CERCLA Criteria

Criteria	Alternative 1		Alternative 2	
	No Action		PeRT Wall, Monitoring, Dewatering and Treatment, and Institutional Controls	
Overall Protection of Human Health and the Environment	Potential future risks posed. Allows unrestricted use of contaminated ground water.		Assumes protectiveness through use of institutional controls. Ground-water treatment will reduce contaminant mass.	
Compliance with-applicable or relevant and appropriate requirements	Complies with ARARs applicable to interim remedial action.		Complies with ARARs applicable to interim remedial action. Will comply with construction and operational requirements. Will at least contribute to, or possibly meet, water-quality standards.	
Short-term Effectiveness	None; current conditions would exist.		Effective at meeting goal of limiting use of contaminated ground water. Expected to reduce mass of contaminants with ground-water treatment.	
Long-term Effectiveness	None, except by natural attenuation.		Interim remedial actions are not required to provide long-term solutions although it is believed that this action will significantly contribute toward meeting long-term goals. Institutional controls provide long term restrictions on ground-water use.	
Reduction of Toxicity. Mobility and Volume through Treatment	None, except through natural processes.		Dewatering with treatment will reduce mass of contaminants on site and downgradient of barrier. PeRT wall may reduce mobility of contaminants.	
Implementability	Implementable--represents current situation.		Implementable--uses standard construction practices and available expertise.	
Cost	Capital	\$ 39,000	Capital	\$2,313,000
	Annual O&M	\$161,000	Annual	414,000
State Acceptance	Not acceptable		Acceptable	
Community Acceptance	Less acceptable		Acceptable	

Alternative 1 could lead to potential future risks associated with use of contaminated ground water. No restrictions would be placed on use of ground water. Wells could be drilled into the alluvial aquifer and used for domestic purposes, resulting in unacceptable risks to users.

Compliance with Applicable or Relevant and Appropriate Requirements

Background

Section 121(d)(1) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), requires that the interim remedial action proposed for OU III must attain, to the extent practical under the selected interim remedial action, a degree of cleanup that ensures protection of human health and the environment. In addition, remedial actions that leave any hazardous substances, pollutants, or contaminants on site must, upon completion, meet a level or standard that at least attains legally applicable or relevant and appropriate standards, requirements, limitation, or criteria that are ARARs under the circumstances of the release. ARARs include Federal standards, requirements, criteria, and limitations and any promulgated standards, requirements, criteria, or limitations under the State environmental or facility siting regulations that are more stringent than Federal standards. In addition, the State ARARs include all promulgated standards and rules associated with delegated State environmental programs and those State regulations with no corresponding Federal regulations.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address the hazardous substances, pollutants, or contaminants, remedial action, location, or other circumstances at the OU III site. Relevant and appropriate requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not applicable to the hazardous remedial action site, address problems or situations sufficiently similar that their use is well-suited to the site.

The criteria for evaluating which requirements are applicable or relevant and appropriate differ depending on whether the requirement is chemical-, action-, or location-specific. According to the NCP, chemical- specific ARARs are usually health- or risk-based numerical values that establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes, or requirements to conduct certain actions to address particular circumstances at the site. Location-specific ARARs generally are restrictions placed on the concentration of hazardous substances or the planned activities solely because they are in special locations. Examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

Comparative Analysis

Alternative 2 for OU III will meet the ARARs that are applicable or relevant and appropriate to this interim remedial action. Federal ARARs that potentially apply to the interim remedial action are summarized in Table 5.3.1- 1; State ARARs are summarized in Table 5.3.1-2.

The OU III Feasibility Study identified Federal and State ARARs that apply to the final remedial alternative. Those requirements are more extensive than requirements for the interim remedial action because of differences in goals and scope. Because the goal of the interim remedial action is to prevent the use of contaminated ground water, reduce contaminant levels in the ground water and surface water, and to evaluate an innovative ground-water treatment technology, restoration of the contaminated aquifer to drinking-water standards is outside the scope of this interim remedial action. However, the interim remedial action should have a significant positive effect toward meeting these standards. Aquifer restoration will be addressed during selection of the final remedy for all of OU III. For this reason, regulations that address restoration of contaminated ground water are not ARARs for this interim remedial action. Those rules and regulations include maximum contaminant levels, the Utah ground-water quality standards, and the Safe Drinking Water Act. Mass contaminant reduction achieved by this interim remedial action will contribute to meeting ARARs for the final remedy.

Because Alternative 1 involves no action, and because the goals of the interim remedial action are not to meet drinking water standards, Alternative 1 complies with ARARs applicable to the interim remedial action. However, it does not meet the objectives of the interim remedial action to prevent exposure to and reduce contaminant mass in the alluvial aquifer.

Table 5.3. 1-1 Federal ARARs for OU III Surface Water and Ground Water

Standard, Requirement, Criterion, or Limitation	Citation	Description	Status	Comment
Safe Drinking Water Act National Primary and Secondary Drinking Water Standards	42 USC 300(g) 40 CFR Part 141 40 CFR Part 143	Establishes health-based standards for public water systems (maximum contaminant levels [MCLs]).	Not applicable as a goal for the interim action.	Because the quality of the alluvial aquifer could allow it to be used as a drinking water aquifer, the MCLs may apply as final cleanup standards. However, the interim action alone may not achieve these standards.
Clean Water Act Water Quality Criteria	33 USC 1251-1376 40 CFR Part 131 "Quality Criteria for Water	Criteria for states to set water quality standards on the basis of toxicity to aquatic organisms and human health.	Not applicable as a goal of the Interim action.	Addresses Montezuma Creek contamination. May not be achievable through the interim action alone.
National Pollutant Discharge Elimination System	40 CFR Parts 122 through 125	Establishes standards for discharges of pollutants into waterways and through the use of underground injection wells.	Applicable through the State.	A point source effluent discharge into Montezuma Creek will be used. Potential storm-water discharges into Montezuma Creek must be controlled.
Dredge or Fill Requirements (Section 404)	40 CFR Parts 230 and 231 33 CFR Part 323 40 CFR Part 404	Regulates the discharge of dredged or fill material into navigable waters and manages wetland areas.	Applicable as location- and action-specific requirement.	Dredged or fill material requirements applicable through the State of Utah standards. EPA has jurisdiction over wetlands at CERCLA sites in the State but no significant effects to wetlands are anticipated.
Clean Air Act National Primary and Secondary Ambient Air Quality Standards	42 USC 7401-7462 40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare.	Applicable through the State of Utah standards as a chemical-, location-, and action-specific requirement.	Seeks to protect and enhance the quality of the nation's air resources.

Table 5.3.1-1 Federal ARARs for OU III Surface Water and Ground Water (continued)

Standard, Requirement Criterion, or Limitation	Citation	Description	Status	Comment
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 40 CFR Parts 260-279	Regulates the generation, treatment, storage, and disposal of hazardous waste.	Applicable through the State of Utah Standards as a chemical-, location-, and action-specific requirement.	Hazardous waste is not known to exist within OU III. However, these regulations will apply if hazardous waste is generated during Installation of the PeRT wall.
Uranium Mill Tailings Radiation Control Act (UMTRCA)	42 USC 2022, 42 USC 7901-7942 40 CFR Part 192	Establishes health-based ground water remediation standards for inactive uranium processing sites.	Not appropriate as a goal of the interim action.	The goals of the Interim remedial action are contaminant reduction and prevention of exposure. These ground-water standards may or may not be achieved.
Floodplain/Wetlands Environmental Review	40 CFR Part 6, Appendix M	Establishes agency policy and guidance for carrying out the provisions of Executive Orders 11988, "Floodplain" Management," and 11990, "Protection of Wetlands."	Applicable as a location- and action-specific requirement.	Remediation actions could affect site floodplains and wetlands and will comply with requirements of the Monticello Wetlands Master Plan.

Table 5.3.1-2 State ARARs for OU III Surface Water and Ground Water

Department/Division	Subject	Statute	Rule	Comments
Department of Environmental Quality, Division of Drinking Water	Safe Drinking Water Rules	Title 19, Chapter 4. Utah Code Annotated (U.C.A.)	R309, Utah Administrative Code (U.A.C.)	The goals of the interim action are contaminant reduction in and prevention of exposure to contaminated ground water. These standards may or may not be met by the interim action alone.
Department of Environmental Quality, Division of Water Quality	Standards for Quality for Waters of the State	Title 19, Chapter 5, U.C.A.	R317-2, U.A.C.	The goals of the interim action are contaminant reduction in and Prevention of exposure to contaminated ground water. These standards may or may not be met by the interim action alone.
	Ground Water Quality Protection	Title 19, Chapter 5, U.C.A.	R317-6, U.A.C.	The goals of the interim action are contaminant reduction in and prevention of exposure to contaminated ground water. These standards may or may not be met by the interim action alone.
	Utah Pollutant Discharge Elimination System	Title 19, Chapter 5, U.C.A.	R317-8, U.A.C.	Applicable requirement. Discharge into Montezuma Creek will comply with the requirement of the permit. Potential storm-water runoff into Montezuma Creek will be controlled.
Department of Environmental Quality, Division of Air Quality	Utah Air Conservation Rules	Title 19, Chapter 2, U.C.A.	R307-1 and R307-12, U.A.C.	This is the State-implemented National Primary and Secondary Ambient Air Quality Standards program. These rules are applicable through the State of Utah standards. Mitigative and restrictive measures such as dust suppressants and reduced speeds on access roads will be used to limit dust emissions and meet fugitive dust requirements.
Department of Environmental Quality, Division of Radiation Control	Radioactive Material Management	Title 19, Chapter 3, U.C.A.	R313-12, R313-15-301, R313-19 through R313-22,and R313-25-18 through R313-25-22, U.A.C.	These provisions address the safe management, including disposal, of radioactive material. Installation of the PeRT wall will comply with these applicable state requirements.

Table 5.3.1-2 State ARARs for OU III Surface Water and Ground Water (continued)

Department/Division	Subject	Statute	Rule	Comments
Department of Environmental Quality, Division of Solid and Hazardous Waste	Hazardous Waste Management Rules (RCRA Subpart C)	Title 19, Chapter 6, Part 1, U.C.A.	R315, U.A.C.	These rules are applicable requirements through the State of Utah standards. Hazardous waste may be generated during installation or removal of the PeRT wall. Compliance with these requirements will be attained. Also, R315-101, Cleanup Action and Risk-Based Closure Standards, is of importance to the interim remedial action because it establishes requirements to support risk-based cleanup at sites where remediation of hazardous constituents to background levels will not be achieved.
Department of Natural Resources, Division of Water Rights	Well-drilling standards (standards for drilling and abandonment of wells)	73-3-25(2)(b), U.C.A.	R655-4, U.A.C.	Includes such requirements as performance standards for casing joints and requirements for abandoning a well. Also included are water right issues associated with consumptive use. This law is applicable to all drilling anticipated and is an applicable requirement.

5.3.2 Primary Balancing Criteria

Short-term effectiveness

Alternative 2 would include construction activities associated with the PeRT wall installation. Mitigative measures, such as dust suppression, would be implemented to minimize short-term impacts. Construction may generate noise and vibrations; heavy equipment use would be required. Activities that could cause disruptions to area residents will be implemented during the times of day that minimize negative effects. The ground-water treatment portion of this alternative would cause short-term reductions of contaminant mass from the alluvial aquifer while a longer-term alternative is being evaluated. Implementation of institutional controls through the Utah State Engineer's office can be quickly accomplished and therefore will provide short-term effectiveness in preventing exposure to contaminated ground water.

For Alternative 1, only monitoring activities would be conducted. Workers conducting these activities would take appropriate precautions (e.g., following appropriate sample collection and handling procedures) to prevent exposure to contaminants. Small localized disturbances to soils and vegetation may occur with the installation and/or maintenance of monitoring wells, but environmental resources would not be significantly affected during the short term. This alternative would have no short-term effects on ground-water or surface-water quality.

Long-term effectiveness

Alternative 2 provides good long-term effectiveness through the use of institutional controls to restrict use of contaminated ground water. Dewatering and treatment of contaminated ground water will result in improved water quality in the alluvial aquifer. Though the interim remedial action is not intended as a long-term solution, it is a first step toward meeting long-term goals.

Long-term effectiveness will be evaluated through monitoring and modeling and a final solution will be selected at a later date.

Alternative 1 would result in a slow decrease in contaminant concentrations in the alluvial aquifer over time as the system attenuates naturally. Modeling indicates this attenuation would take greater than 100 years to return to acceptable concentrations. Additionally, this alternative provides no controls to limit the use of or access to OU III ground water during the time contaminant concentrations are decreasing.

Reduction of Toxicity, Mobility, and Volume through Treatment

Dewatering and treatment of ground water through implementation of Alternative 2 results in an irreversible reduction of contaminant mass in ground water. The treatment process will remove contaminants from the ground water and immobilize the contaminants by placing them in the repository constructed for OU I. Discharge of treated ground water will meet UPDES requirements for surface water. If effective, the PeRT wall will achieve a reduction in mobility of contaminants and a reduction in volume of the contaminant plume downgradient of the wall.

Alternative 1 does not achieve a reduction in toxicity, mobility, or volume through treatment.

Implementability

Alternative 2 is implementable. Institutional controls can be put in place and administered through the State Engineer. Monitoring and ground-water extraction/treatment are a continuation of ongoing activities and are therefore implementable. The PeRT wall is less proven, but treatability studies have shown that the technology is successful in removing contaminants of concern from site-specific ground-water samples. Use of the same technology in similar situations has been successful. Standard construction practices and materials are used for PeRT wall installation; a number of vendors are available to supply each of the component parts and services.

Alternative 1 is implementable and represents the current situation.

Cost

For Alternative 1, capital costs are estimated at \$39,000; O&M costs are estimated at \$161,000 annually.

For Alternative 2, capital costs are estimated at \$2,313,000; O&M costs are estimated at \$414,000 annually.

Breakdown of costs for Alternative 2 are as follows:

Institutional Controls	
Capital Costs	\$ 20,000
Monitoring	
Capital Costs	\$ 39,000
Annual Costs	\$ 161,000
Geochemical Testing	
Capital Costs	\$ 52,000
PeRT Wall	
Capital Costs	\$2,203,000
Annual Costs	\$ 253,000

Costs for dewatering and treatment of the Millsite are not included in the estimate for Alternative 2, because currently, they are included as part of OU I and the need to continue those activities after Millsite excavation is completed is not known at this time.

5.3.3 Modifying Criteria

State Acceptance

Alternative 2 is acceptable to the State.

Alternative 1 is not acceptable to the State.

Public Acceptance

Public input was not specifically sought on the acceptability of Alternative 1. As support of Alternative 2 was made publicly, it can be assumed that Alternative 2 has more public support than Alternative 1. Generally, the public showed little interest in the OU III remedy selection process, but those involved reacted favorably toward the preferred Alternative 2. For more information see the Responsiveness Summary in this document (Appendix A).

EPA Acceptance

Because DOE was the lead agency for this interim remedial action, and because DOE is the agency proposing the action, EPA acceptance is also addressed here (though it is not one of the CERCLA criteria).

Alternative 2 is acceptable to EPA.

Alternative 1 is not acceptable to EPA.

6.0 Selected Remedy

The selected interim remedial action for MMTS OU III is Alternative 2-Institutional Controls, Millsite Dewatering and Treatment, Monitoring, and PeRT Wall Installation and Evaluation. Institution controls will restrict the use of contaminated ground water while ground-water remediation is in progress. Access to water rights will be prohibited and a moratorium will be placed on drilling new water wells in the contaminated alluvial aquifer. These controls will be administered through the State Engineer. Monitoring will continue on a semiannual basis and be reviewed as data becomes available to assess the effectiveness of the interim remedial action. Monitoring will involve sampling up to 24 monitoring wells and 8 surface-water locations and analyzing for all metal and radionuclide COCs for OU III (DOE 1997). Ongoing Millsite dewatering and treatment will continue during the remediation of OU I and if determined necessary, will be continued after excavation of source material from the Millsite is complete. Water is currently undergoing chemical treatment followed by micro filtration and/or reverse osmosis. Secondary wastes generated are disposed in the on-site repository. Clean water is discharged to Montezuma Creek in accordance with UPDES requirements. Installation of the pilot-scale PeRT wall will determine the effectiveness of the technology in removing contaminants from the ground water at the MMTS.

Costs associated with this alternative are as follows:

Present worth (5-year period):	\$4,010,400
Capital:	\$2,313,000
Annual O&M:	\$ 414,000

The PeRT wall is an innovative technology, so there are uncertainties associated with its performance. However, treatability studies have proven promising to date, and the technology has been used successfully at sites similar in nature to OU III. Performance of the PeRT wall will be monitored on a regular basis, and if problems arise, steps can be taken to correct them. Additionally, a five-year review of the monitoring data will be conducted to assess the performance of the interim remedial action and assist in the development of the final remedial action for OU III.

7.0 Statutory Determinations

The selected interim remedial action meets the statutory requirements of CERCLA. These statutory requirements include protection of human health and the environment, compliance with ARARs (within the scope of the interim remedial action), cost effectiveness, and use of permanent solutions and alternative treatment technologies to the maximum extent practicable. Water extracted through dewatering will be treated at the existing water treatment plant. If effective, the PeRT wall will treat contaminated ground water. The manner in which the selected interim remedial action for OU III meets each of the requirements is presented in the following discussion.

7.1 Protection of Human Health and the Environment

The interim remedial action is anticipated to be protective of human health and the environment by limiting exposure to contaminated ground water through use of institutional controls and by reducing contaminant mass in surface water and ground water downgradient of the Millsite. Implementation of the selected interim remedy is a preliminary step in achieving long-term protection.

7.2 Compliance with Applicable or Relevant and Appropriate Requirements

The interim remedial action selected for OU III will meet the ARARs that are applicable or relevant and appropriate to this interim remedial action. These ARARs include the National Pollutant Discharge Elimination System (administered through the State as the UPDES), the State of Utah's Hazardous Waste Management rules, and the Flood plain/Wetlands Environmental Review.

Aquifer restoration will be addressed during selection of the final remedy for all of OU III. For this reason, regulations that address water quality standards are not ARARs for this interim remedial action though the interim remedial action should make progress toward meeting those standards. These standards include maximum contaminant levels, the Utah ground-water quality standards, and the Safe Drinking Water Act. Additional information regarding ARARs for the interim remedial action is provided in Tables 5.3.1-1 and 5.3.1-2.

7.3 Cost Effectiveness

Overall cost effectiveness can be defined as the overall effectiveness proportionate to cost, such that an action represents a reasonable value. The selected remedy for OU III will prevent exposure to contaminated ground water at a reasonable cost, thus improving protection to human health and the environment. The selected interim remedial action has a cost that is within the same range as alternatives considered in the feasibility study for the site. If greater treatment efficiency, cost effectiveness, or ease of implementability can be established at a later date, other alternatives would be considered.

7.4 Use of Permanent Solutions and Treatment Alternative Technologies or Resource Recovery Technologies to the Maximum Extent Practical

Ongoing dewatering and treatment of ground water at the Millsite fulfills this requirement. Contaminated water is treated to meet UPDES requirements before discharge to Montezuma Creek. Ground water is permanently treated by removal of contaminants by chemical and physical methods.

If the PeRT wall is effective, the final proposed remedial action for OU III may employ treatment through the use of an innovative technology. However, the reactive materials installed in constructing the PeRT wall may require recovery and disposition at an off-site disposal facility at some time in the future. Because this is only an interim remedial action measure, its effectiveness will be evaluated in the final feasibility study for OU III. This action utilizes permanent solutions and alternative treatment

technologies to the maximum extent possible, given the limited scope of this action.

7.5 Preference for Treatment as a Principal Element

Water recovered during Millsite dewatering is being treated before discharge. If the PeRT wall is successful, it will treat ground water in situ. Thus, this alternative satisfies the preference for treatment as a principal element. The final decision document for the site will further address this preference as it relates to the final alternative selected for the site.

7.6 Balancing Criteria

The selected interim remedial action provides the best balance of tradeoffs compared with the no-action alternative with respect to the five summary balancing criteria, which include

- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.

The criteria most critical in the selection of this remedy were short- and long-term effectiveness and reduction of toxicity, mobility, or volume through treatment. The no-action alternative would have no effect on site conditions and would not prevent exposure to contaminated ground water. The combination of institutional controls and Millsite dewatering and treatment prevents near-term exposure to ground water and reduces contaminant mass in the aquifer, contributing to long-term effectiveness.

The selected remedy was the preferred alternative identified in the proposed plan. No significant changes were made to the preferred alternative. Because the public meeting and comment period did not generate any significant comments opposed to the interim remedial action presented in the Proposed Plan, the selected remedy is assumed to have community acceptance.

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Responsiveness Summary

Overview

This Responsiveness Summary provides information about the views of the community with regard to the proposed interim remedial action for Operable Unit (OU) III ground water at the Monticello Mill Tailings Site (MMTS), documents how public comments have been considered during the decision-making process, and provides responses to concerns.

The public was informed of the selected remedial action in the following ways:

- All items contained within the Administrative Records have been on file at the subject repositories since the final, or in some cases draft final, version of each document was issued.
- A copy of the Proposed Plan for the interim remedial action was sent to interested stakeholders and was made available in the public reading room and at the public meeting.
- A public comment period was held from March 27, 1998, to April 27, 1998.
- A full page notice of the public comment period and public meeting was published in the local weekly newspaper before the public meeting.
- Notices of the public comment period and public meeting were prominently posted at several of the most frequented businesses in the Monticello area.
- A public service announcement was aired by a local radio station to notify listeners about the time and location of the public meeting.
- A public meeting was held on April 7, 1998, at the Monticello High School auditorium.
- Written comments by the public were encouraged.

The public meeting was sparsely attended. The few questions and comments that were received are summarized, along with responses, in this responsiveness summary. The selected remedy presented in the Proposed Plan was not modified based on any comments received. The public meeting also included a discussion of proposed cleanup of soils and sediments associated with OU III through a removal action. Comments received on the removal action are included in the Action Memorandum for that removal action.

Background on Community Involvement

The public participation requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 113(k)(2)(B)(i-v) and Section 117 are being followed for OU III. MMTS has a Community Relations Plan that has been updated annually. The most recent revision of the plan is currently undergoing revision. The community relations activities include (1) distribution of fact sheets and other written materials, (2) news releases to the local newspaper, (3) public meetings, (4) display ads announcing the availability of key documents and meetings, (5) public comment periods, and (6) responsiveness summaries for Records of Decision.

Copies of all site-specific documents used in developing the interim-action decision were made available to the public through the Administrative Record for the site housed at the Monticello City Offices. Copies of the Proposed Plan (DOE 1998b) for an interim remedial action at OU III were included in the site Administrative Record and distributed to stakeholders. The notices of availability for these documents were published in the local Monticello newspaper. A public comment period on the interim remedial action was held from March 27 to April 27, 1998, and a public meeting was held on April 7, 1998. At this meeting, representatives from DOE, the Environmental Protection Agency, and the State of Utah answered questions about the site and the selected remedy. A summary of the meeting and public comments received at that meeting and during the public comment period are presented in this appendix for inclusion in the Administrative Record. The decision for an interim remedial action at this site is based on information in the Administrative Record.

Summary of Public Comments and Agency Responses

I. Comments received at the Public Meeting

- (1) One community member asked if the contaminated ground water could be pumped into Montezuma Creek to dilute it instead of treating it.

DOE Response: This isn't possible because State laws don't allow it.

- (2) One community member asked what process would be used to treat the ground water.

DOE Response: Ground water will be treated with a combination of chemical reaction and filtration (both micro filtration and reverse osmosis).

- (3) One community member perceived the levels of contaminants in the ground water to be so low that the need for treatment was questioned.

DOE Response: The contamination, though measured in small amounts, would be harmful if someone were to drink it for their main source of water for their lifetime. CERCLA requires that both current and potential future uses be considered.

- (4) One community member suggested pumping out contaminated ground water and using it as dust control in the repository. The community member noted that when the tailings source removal was complete, then the whole site would be cleaned up.

DOE Response: Contaminated ground water is being used as dust control in the repository, but it is predicted that areas of ground-water contamination will remain after Millsite cleanup.

- (5) One community member asked what the ground-water flow rates were at the site.

DOE Response: The amount of water moving past the eastern boundary of the Millsite is 40 to 50 gallons per minute.

- (6) One community member asked if the creek water was dangerous to animals.

DOE Response: The ecological risk assessment concluded that there is no significant risk to animals from drinking the water.

- (7) One community member commented that the original study claimed that there would be 2 cancer deaths in 100,000 people after 70 years. The commenter noted that Monticello has less than 2,000 people, so there should be no effect on its population.

DOE Response: This was a statement; no response was given.

II. Informal comments and other community involvement activities

- (1) The week following DOE's public meeting on April 15, 1998, the Site-Specific Advisory Board for the MMTS met. Members of the board unanimously supported the preferred interim remedial action alternative as presented by DOE the previous week.

III. Written comments and responses

None were received.